Section 15. Striped Bass

Introduction

The striped bass management program has been successful at rebuilding the Atlantic coastal stock from a low of 20 million pounds to a high of 160 million pounds over a 15-year period (ASMFC 2005). The stock is currently managed under a set of biological reference points (targets and thresholds) based on biomass and fishing mortality rates that protect the stock and prevent overfishing. The extensive management program is highlighted below. Striped bass play an important role in the Chesapeake Bay ecosystem as a top predator in the food web. Currently there is concern about the amount of food available to maintain increased stock size of striped bass.

Chesapeake Bay FMP

In 1985 Maryland enacted a moratorium on striped bass fishing and Virginia enacted size limits and seasonal restrictions in order to address striped bass management issues within the Chesapeake Bay and began developing a CBP FMP. In 1989, the Potomac River and Virginia striped bass fisheries were closed and the CB FMP for striped bass was adopted. The plan addressed overfishing; reduced spawning stock; allocation; gear restrictions; selling and buying seasons, creel limits and fishing areas; monitoring needs and procedures; enforcement authority; stock assessment; research needs; and water quality. In the Chesapeake region, limited recreational and commercial fisheries were reopened for the 1990/1991 season. After critically reviewing the ASMFC Amendment 5, the Chesapeake Bay Program's Fishery Management Workgroup agreed to adopt the goals and objectives, management program specifications/elements, management program implementation and compliance items as detailed in ASMFC Amendment 5. As a result, Amendment 1 to the Chesapeake Bay Program Striped Bass FMP, supersedes the 1989 CBPSB FMP (Table 15.1). It formally adopts the ASMFC Amendment 5 as part of the Chesapeake Bay management strategy. In addition, the CBPSB FMP Amendment 1 has expanded the habitat section, which defines striped bass habitat within the Chesapeake Bay, and specifies management strategies for protecting striped bass habitat. Protecting striped bass spawning habitat is critical since the Chesapeake Bay produces a major portion of coastal migratory striped bass. An ecosystem-based management plan is currently under development for striped bass.

Atlantic Coast FMP

Management strategies to address declining stocks were first recommended in 1981 when the Atlantic States Marine Fisheries Commission (ASMFC) Striped Bass Fishery Management Plan (FMP) was developed and adopted. The plan was not completely effective because states were at their own discretion to implement ASMFC recommendations. In 1984, Congress passed legislation providing federal authority to close striped bass fisheries in those states that did not comply with ASMFC recommendations. With the increased implementation of harvest restrictions by states along the coast, the abundance of striped bass began improving.

Since the adoption of the ASMFC Striped Bass FMP in 1981, the plan has been amended six times and three addenda have been added. In 1995 when the stock was formally declared recovered, ASMFC Amendment 5 was adopted and replaced the original ASMFC FMP. Addenda I (1997) and II (1998) to Amendment 5 were developed to specify fishing regulations. Addendum II also revised the target fishing mortality rate and adopted a new assessment tool for the Atlantic coastal stocks. While Amendment 5 was successful in restoring striped bass stocks, it had a large range of management programs that were cumbersome and lacked direction to managers with respect to target or threshold biomass levels. In response to the rising concern, Amendment 6 to the Interstate Fisheries Management Plan for Striped Bass was adopted in February 2003 but was not fully implemented until the following year.

General requirements of the ASMFC Amendment 6 include setting a fishing mortality (F) target level, introducing a threshold and target female spawning stock biomass, requiring a female SSB survey, requiring a juvenile abundance survey, and requiring the compilation of fisheries and non-fisheries information. Under Amendment 6, the striped bass F threshold is 0.41 and the striped bass target F is 0.30 for coastal waters. For the Chesapeake Bay, F is lower (0.27) because Maryland and Virginia have a smaller minimum size limit then the coast. The coastal commercial fishery is managed under a quota and allocated on a state-by-state basis. The total catch allocation for the commercial fishery is 131,560 pounds for Maryland coastal waters and 184,853 pounds for Virginia coastal waters. The commercial quota for the Chesapeake Bay is in addition to the coastal quota and separate from it. The Maryland commercial quota for striped bass has steadily increased from 1.76 million pounds (2002) to 2.07 million pounds (2005).

In addition to managing fishing effort, the spawning stock biomass (SSB) is monitored and management measures adjusted according to a SSB target and threshold. The female SSB is designed to ensure a minimum number of sexually mature females in the population and is based on the estimated biomass of sexually mature females from 1995. The coastal female SSB threshold is 30.9 million pounds or greater and a female SSB target of at least 38.6 million pounds.

If F exceeds the F-target or F-threshold or SSB falls below the SSB-target or SSB-threshold, certain steps will be taken to ameliorate the situation. The striped bass stock will be considered overfished if the F exceeds the F-threshold or if the SSB falls below the SSB-threshold. Management measures will be developed as needed based on evaluating the stock status in reference to the targets and thresholds.

Stock Status

Atlantic Coast

From a coast-wide perspective, the estimated striped bass stock size has increased since the early 1990's. Population estimates for 2001-2004 indicate that the population is fluctuating around 50 million fish (Table 15.2). The spawning stock biomass (SSB) along the entire Atlantic coast remained above the SSB target level of 30.9 million pounds

during 2001 and 2002 under Amendment 5 regulations. In 2003, SSB dropped to 29.9 million pounds but was calculated utilizing a method specified under Amendment 6. There is some concern over the accuracy of the SSB estimate, the lack of agreement between the different methods used to generate the SSB, and the significant differences between the age groups considered to be within the SSB using the Amendment 5 and Amendment 6 guidelines. Direct comparisons between SSB calculations utilizing Amendment 5 methodologies and calculations utilizing Amendment 6 methodologies are not appropriate.

Overall F is calculated by using a virtual population analysis (VPA) and a tag-based F estimate. Estimates of F under Amendment 5 (up until 2003/2004) utilized striped bass in the 4-11 age class while Amendment 6 (fully implemented for 2004) only considered striped bass that were in the 8-11 age class. As a result, estimates of F up to 2003 can not be directly compared to the 2004 estimate. Both the 2002 and 2003 estimated F of fish in the 4-11 year age class were approximately 0.30 which indicates little change in fishing pressure. F for 2004, under Amendment 6 standards, is estimated to be approximately 0.62 but only considers fish in the 8-11 age class. This F exceeds both the F target of 0.30 and the F threshold of 0.41 as specified in Amendment 6 goals.

Chesapeake Bay

Maryland monitors the juvenile abundance of both young-of-the-year (YOY) striped bass and age 1 striped bass through the use of a seine survey that establishes a juvenile abundance index (JAI). The results of the YOY seine surveys for 2001- 2004 (Table 15.2) indicate that both 2001 and 2003 had large JAI's when compared to the average, 11.9. The JAI for 2004 was average (11.4) while the JAI for 2002 was low (4.7). The lowest historical JAI was recorded in 1981 (1.2).

The age 1 striped bass index (Table 15.2) data is collected through the same seine survey as the YOY survey and calculates an age 1 index for the Chesapeake Bay based on the YOY index. The age 1 index for 2001 and 2003 were relatively high (0.58 and 0.55) with the highest recorded age 1 in 1970 (0.74). The age 1 index for 2002 was low (0.07) with the lowest age 1 index in 1980 and 1981 (0.02).

Estimates of striped bass SSB in the Chesapeake Bay (Table 15.2) are made annually from data collected at two permanent sampling locations within the Bay. The location in the Upper Chesapeake Bay have indicated high levels of SSB with 2001 and 2003 being particularly good, 490.21 and 566.24, as compared to the recorded high of 547 in 1995. The SSB of 2002 was the lowest in the 2001-2004 time series with 266.39 but significantly higher than the recorded low of 65 (1985). Estimates of SSB at the sampling location in the Potomac River, also show favorable indications of SSB. In the 2004 season, the SSB was 578.78, the highest recorded SSB for the Potomac River. The lowest SSB during 2001-2004 was 118.46 (2003). This is significantly higher than the lowest recorded SSB for the Potomac River, which was 25 in 1985.

Fisheries Statistics

Overall

Striped bass commercial and recreational harvests from the have been increasing since the removal of the moratorium in 1990. Commercial harvest levels of striped bass for Maryland are equivalent to the levels observed in the early 1960's (Figure 15.1). Of the total commercial Maryland harvest, 94% is from the Chesapeake Bay, approximately 4% comes from the coastal region that lies more than three miles from shore in the federally managed Economic Exclusion Zone (EEZ), and the remainder of the catch coming from the outer bays and near shore coastal waters of the state. The total coastal striped bass harvest has averaged around 4.0 million pounds. Of that catch, the recreational fishery comprises approximately 75% and commercial fishery comprises the remaining 25%. Maryland's recreational fishery accounts for approximately 22% of the total coastal recreational landings.

Maryland

Maryland's commercial striped bass harvest is managed under a quota system with a separate allocation each for the Chesapeake Bay and the Atlantic coast. As the striped bass stock has increased over the years, the annual quota has increased. In general, the actual harvest has not exceeded the quota (Table 15.4).

Maryland's recreational striped bass harvest has fluctuated over the past four years (Table 15.3). The 2002 season was the lowest of the time series with 1.4 million pounds harvested. Estimated harvest for 2001and 2003 was 2.1, and 2.8 million pounds respectively. The 2004 estimate has not been calculated yet.

Emerging Issues

Current research needs identified in the ASMFC 2004 striped bass FMP review include: conducting an analysis of current state and federal fishery monitoring programs to determine the most accurate method of determining population status; develop a method of integrating VPA and tagging models to produce a single estimate of F; and, developing studies to improve information on discard and bycatch mortality rates. Current efforts on analyzing stock compositions and migrations, and determining factors that affect recruitment should be maintained in the upcoming year.

Conclusion

The striped bass population estimates within the Chesapeake Bay have generally increased over the 2001-2004 timeframe. Indices of juvenile abundance in the Chesapeake Bay have indicated that net juvenile production is above average for the same period. Changes in the methodology used to calculate the SSB and F make comparisons of the 2004 estimate to other years difficult but the ASFMC Technical Committee is working to resolve the situation.

Full implementation of Amendment 6 was required for the 2004 fishing season. It will take several years to see the results of these regulations on the striped bass population. The ASMFC will review the effectiveness of Amendment 6 regulations in 2007.

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Table 15.1. Amendment 1 to the 1989 Chesapeake Bay Striped Bass Fishery Management Plan (10/05)

Management Areas	Action	Date	Comments
Stock Status	Amendment 1 to the Chesapeake Bay Program FMP augments the 1989 Plan. CBP jurisdictions adopted coastal ASMFC management scenarios for the Bay. The coastal stock was declared restored to historic levels in 1995. ASMFC approved Amendment VI of the Interstate Fisheries Management Plan for Atlantic Striped Bass in February 2003.	February 2003 Continue	CBP jurisdictions have option of maintaining current regulations or implementing stricter regulations than required under ASMFC Amendment VI.
Monitoring Requirements	Amendment V of the Interstate FMP requires CBP jurisdictions to compile results of their commercial and recreational fisheries and submit them to ASMFC. Specific monitoring requirements may be changed as necessary. Amendment VI modifies the monitoring requirements by adding a mandatory discard data collection program.	1995 February 2003 Continue	ASMFC requirements are part of a bycatch reduction program. CBP jurisdictions are tracking commercial and recreational fishing mortalities and will add bycatch data to their fishery statistics information.
Assessment of Recruitment	Amendment V of the Interstate FMP requires MD and VA to conduct annual juvenile abundance (JAI) surveys. Amendment VI modifies the acceptable level of variation allowed in the JAI from 90% to 75%. If MD and VA juvenile indices are lower than 75% of all other values in the data set for three consecutive years additional actions may be taken.	1995 2003 Continue	Juvenile abundance data is used by ASMFC to estimate coastal SSB and VPA of coastal stock
Spawning Stock Biomass (SSB)	If SSB decreases below the (1960-1972) reference level, additional actions may be taken	1997 Continue	MD and VA provide data to ASMFC to estimate SSB and conduct VPA.
Fishing Mortality (F)	The current target fishing mortality rate is F=0.30 and the overfishing definition is F_{msy}=0.41. If coastwide estimated mortality rates exceed the target rate for 2 consecutive years the ASMFC Management Board will recommend harvest reductions	2000 Continue	All CBP jurisdictions have implemented regulations to insure the target mortality is not exceeded. MD and VA have instituted tagging programs to estimate migration and mortality rates.
Stocking	The coastal stock has been restored	1995	Maryland and Virginia discontinued stocking of striped bass
Bycatch reduction	CBP jurisdictions are required to estimate discard mortality to ASMFC	1995 Continue	CBP jurisdictions are in full compliance. Estimates of bycatch discard mortalities are used in VPA of coastal stock.

Table 15.1. Amendment 1 to the 1989 Chesapeake Bay Striped Bass Fishery Management Plan (10/05)

Management Areas	Action	Date	Comments
Habitat	CBP jurisdictions are required to delineate essential fish habitat and habitat areas of concern	2001 Continue	CBP jurisdictions have developed and implemented management strategies to protect striped bass habitat. Maryland spawning areas are protected from harvest March through May.

ASMFC= Atlantic States Marine Fisheries Commission
FMP= Fishery Management Plan
VPA= Virtual Population Analysis
CBP= Chesapeake Bay Program
SSB= Spawning Stock Biomass

TABLE 15.2- Atlantic Coast Striped Bass Statistics (2001-2004)

	2001	2002	2003	2004
Stock Size (millions of fish)	59.6	52	44	56.7
SSB (millions of pounds)	55.3	49.2	30.0	Unavailable
Recruitment (age 1) millions of fish	very strong	strong	very strong	average
Fishing Mortality (F)				
VPA (ages 8-11):	N/A	0.35	0.62 (8-11)	Unavailable
VPA (ages 7-10):	0.29	N/A	N/A	Unavailable
VPA (ages 4-10 or 4-11):	0.23	0.29	N/A	Unavailable
VPA (ages 3-8):	N/A	N/A	0.29	Unavailable
n weighted F (ages 7-11):	N/A	0.33	0.53	Unavailable
n weighted F (ages 5-10):	0.21	N/A	N/A	Unavailable
Recreational Catch (millions of fish)	2,012,314	1,828,367	2,405,707	Unavailable
Commercial Catch (millions of fish)	941,733	654,062	865,689	Unavailable

TABLE 15.3- Maryland Striped Bass Harvest Statistics (2001-2004)

	2001	2002	2003	2004	Record High	Record Low	Mean
JAI (time series average)	50.8	4.7	25.8	11.4	59.3 (1996)	1.2 (1981)	11.9
JAI (Geometric mean catch per survey haul)	12.57	2.2	10.83	4.85	17.46 (1996)	0.59 (1959 and 1982)	4.27
AGE 1 index (log Mean)	0.58	0.07	0.55	na	0.74 (1970)	0.02 (1980/81)	0.20
SSB (kg)							
Upper Bay	490.21	266.39	566.24	389.76	547 (1995)	65 (1985)	259.51
Potomac River	273.23	380.74	118.46	578.78	578.78 (2004)	25 1985)	237.16
MD commercial harvest (lbs)	2,049,269	2,085,103	2,193,375	2,109,325	14,740,500 (1973)	327,721 (1986)	5,859,015
Recreational Harvest (Lbs)	2,072,943	1,423,515	2,808,923	N/A	2,808,923 (2003)	0 (1982 and 1989)	254,740
MD Fishing mortality (F)	0.37	0.31	0.4	N/A	N/A	N/A	N/A

Table 15.4 Maryland Striped Bass Commercial Quotas and Harvest for the Chesapeake Bay and Atlantic Coast, 2002-2005

Fishing Year	CB Commercial Quota	CB Commercial Harvest	MD Atlan. Com. Quota	MD Atlan. Com. Harvest
2002	1,760,000	1,732,146	91,000	89,386
2003	1,935,000	1,720,708	91,000	99,633
2004	1,873,000	1,784,056	126,396	115,453
2005	2,066,322	1,075,014 (through Aug 05))	126,396	13,709 (through Aug. 05)

From Maryland DNR Fisheries Service, Limited Entry Program

Figure 15.1. Commercial Harvest of Striped Bass from Maryland and Virginia, 1950-2004